

CLAIMS

What is claimed is:

1. A method for automatically processing and managing
2 spatial asset information in a repository, the method comprising:
defining instances of primary observation types and
4 associations between each of the specific instances;
identifying reference networks and geographic information
6 system asset layers in the repository;
configuring the repository based on said instances definitions
8 and said associations;
collecting field data;
10 converting said collected field data to specific observations;
correlating said specific observations to the appropriate said
12 reference network and said geographic information system asset
layers; and
14 updating said appropriate geographic information system asset
layers in the repository.

2. The method defined in Claim 1 further comprising:
2 configuring automatically analysis tools to exploit data in
the repository so that said analysis tools are based on said
4 instances definitions.

3. The method defined in Claim 1 wherein said collecting of

2 field data step further comprises:

capturing free speech stating verbal observations containing

4 voice data;

capturing location data contemporaneously with each of said

6 verbal observations;

time-stamping each of said captured verbal observations to

8 create a raw verbal observation; and

time-stamping said captured location data.

4. The method defined in Claim 3 further comprising:

2 using a mobile unit computer in communication with a global
positioning satellite receiver to capture said location data.

5. The method defined in Claim 3 further comprising:

2 using a mobile unit computer in communication with a sound
board for capturing said free speech stating verbal observations
4 containing voice data.

6. The method defined in Claim 3 further comprising:

2 constructing a predefined reference grammar for said voice
data to be captured;

4 incorporating a semantic relationship structure in said
predefined reference grammar; and

6 using said predefined reference grammar and said semantic
relationship structure to enable said voice data in at least two of
8 said raw verbal observations to be combined automatically with said
captured location data into a single record in a geographic
10 information system database.

7. The method defined in Claim 6 further comprising:

2 using a mobile unit computer for capturing both said location
data and said free speech stating verbal observations containing
4 voice data; and

transferring said captured location data and said captured
6 voice data from said mobile unit computer to a processing computer,
wherein said processing computer combines said captured voice data
8 and said captured location data into said single record which is
stored in said geographic information system database which is
10 connectable to said processing computer.

8. The method defined in Claim 6 further comprising:

2 configuring said predefined reference grammar and said
semantic relationship structure to a specific form for a specific
4 application.

9. The method defined in Claim 8 wherein said specific
2 application is a street maintenance application and said predefined
reference grammar and said semantic relationship structure are

4 configured to said specific form for use in said street maintenance
application.

10. The method defined in Claim 6 further comprising:
2 time-stamping all records in said geographic information
system database using only a central processing unit clock of a
4 computer.

11. The method defined in Claim 10 further comprising:
2 capturing a third stream of sensor data;
time-stamping all said captured third stream of sensor data
4 by said central processing unit clock of said computer; and
combining automatically specific items of sensor data into
6 specific records having specific voice data and specific location
data by using said time-stamping as a synchronizing key.

12. An apparatus for automatically processing and managing
2 spatial asset information in a repository, the apparatus
comprising:

4 defining means for defining instances of primary observation
types and associations between each of the specific instances;

6 identifying means for identifying reference networks and
geographic information system asset layers in the repository;

8 configuring means for configuring the repository based on said
instances definitions and said associations;

10 data collection means for collecting field data;

12 converting means for converting said collected field data to
specific observations;

14 correlating means for correlating said specific observations
to the appropriate said reference network and said geographic
information system asset layers; and

16 updating means for updating said appropriate geographic
information system asset layers in the repository.

13. The apparatus defined in Claim 12 further comprising:

2 configuring means for automatically configuring analysis tools
to exploit data in the repository so that said analysis tools are
4 based on said instances definitions.

14. The apparatus defined in Claim 12 wherein said data
2 collection means captures free speech stating verbal observations

containing voice data and also captures location data
4 contemporaneously with each of said verbal observations, and
wherein the apparatus includes time-stamping means for time-
6 stamping each of said captured verbal observations to create a raw
verbal observation and for time-stamping said captured location
8 data.

15. The apparatus defined in Claim 14 wherein said data
2 collection means includes a mobile unit computer in communication
with a global positioning satellite receiver to capture said
4 location data.

16. The apparatus defined in Claim 14 wherein said data
2 collection means includes a mobile unit computer in communication
with a sound board for capturing said free speech stating verbal
4 observations containing voice data.

17. The apparatus defined in Claim 12 further comprising:
2 reference grammar means for interpreting captured voice data
contained in a plurality of verbal observations;
4 said reference grammar means incorporating a semantic
relationship structure means for combining said captured voice data
6 contained in at least two of said plurality of verbal observations;
and

8 data conversion processing means for using said reference
grammar means and said semantic relationship structure means to
10 enable said captured voice data in said at least two of said
plurality of verbal observations to be combined automatically with
12 said captured location data into a single record in a geographic
information system database.

18. The apparatus defined in Claim 17 wherein said data
2 collection means includes a mobile unit computer for capturing both
said location data and said free speech stating verbal observations
4 containing voice data, and wherein the apparatus further comprises:

a processing computer and a data transfer means for
6 transferring said captured location data and said captured voice
data from said mobile unit computer to said processing computer
8 which combines said captured voice data and said captured location
data into a single record which is stored in said geographic
10 information system database connectable to said processing
computer.

19. The apparatus defined in Claim 17 further comprising:

2 a grammar configuring means for configuring said reference
grammar means and said semantic relationship structure means to a
4 specific form for a specific application.

20. The apparatus defined in Claim 19 wherein said specific
2 application is a street maintenance application and said reference
grammar means and said semantic relationship structure means are
4 configured to said specific form for use in said street maintenance
application.

21. The apparatus defined in Claim 17 wherein said time-
2 stamping means time-stamps all records in said geographic
information system database using only a central processing unit
4 clock of a computer.

22. The apparatus defined in Claim 21 wherein said data
2 collection means captures a third stream of sensor data, and
wherein said time-stamping means time-stamps all captured third
4 stream of sensor data by said central processing unit clock of said
computer, and wherein said converting means automatically combines
6 specific items of sensor data into specific records having specific
voice data and specific location data by using said time-stamping
8 as a synchronizing key.

23. Computer-readable media tangibly embodying a program of
2 instructions executable by a computer to perform a method for
automatically processing and managing spatial asset information in
4 a repository, the method comprising:

defining instances of primary observation types and
6 associations between each of the specific instances;

identifying reference networks and geographic information
8 system asset layers in the repository;

configuring the repository based on said instances definitions
10 and said associations;

collecting field data;

12 converting said collected field data to specific observations;

correlating said specific observations to the appropriate said
14 reference network and said geographic information system asset
layers; and

16 updating said appropriate geographic information system asset
layers in the repository.

24. The computer-readable media defined in Claim 23 further
2 comprising:

configuring automatically analysis tools to exploit data in
4 the repository so that said analysis tools are based on said
instances definitions.

25. The computer-readable media defined in Claim 23 wherein
2 said collecting of field data step further comprises:
capturing free speech stating verbal observations containing
4 voice data;
capturing location data contemporaneously with each of said
6 verbal observations;
time-stamping each of said captured verbal observations to
8 create a raw verbal observation; and
time-stamping said captured location data.

26. The computer-readable media defined in Claim 25 wherein
2 the computer is a mobile unit computer in communication with a
global positioning satellite receiver to capture said location
4 data.

27. The computer-readable media defined in Claim 25 wherein
2 the computer is a mobile unit computer in communication with a
sound board for capturing said free speech stating verbal
4 observations containing voice data.

28. The computer-readable media defined in Claim 25 further
2 comprising:
constructing a predefined reference grammar for said voice
4 data to be captured;

incorporating a semantic relationship structure in said
6 predefined reference grammar; and

using said predefined reference grammar and said semantic
8 relationship structure to enable said voice data in at least two of
said raw verbal observations to be combined automatically with said
10 captured location data into a single record in a geographic
information system database.

29. The computer-readable media defined in Claim 28 wherein
2 the computer is a mobile unit computer used for capturing both said
location data and said free speech stating verbal observations
4 containing voice data, and further comprising:

transferring said captured location data and said captured
6 voice data from said mobile unit computer to a processing computer,
wherein said processing computer combines said captured voice data
8 and said captured location data into said single record which is
stored in said geographic information system database which is
10 connectable to said processing computer.

30. A computer programmed to execute a process for
2 automatically processing and managing spatial asset information in
a repository, the process comprising:

4 defining instances of primary observation types and
associations between each of the specific instances;

6 identifying reference networks and geographic information
system asset layers in the repository;

8 configuring the repository based on said instances definitions
and said associations;

10 collecting field data;

12 converting said collected field data to specific observations;

14 correlating said specific observations to the appropriate said
reference network and said geographic information system asset
layers; and

16 updating said appropriate geographic information system asset
layers in the repository.

31. The computer as in Claim 30 wherein the process further
2 comprises:

4 configuring automatically analysis tools to exploit data in
the repository so that said analysis tools are based on said
instances definitions.

32. The computer as in Claim 30 wherein the process further
2 comprises:

capturing free speech stating verbal observations containing
4 voice data;
capturing location data contemporaneously with each of said
6 verbal observations;
time-stamping each of said captured verbal observations to
8 create a raw verbal observation; and
time-stamping said captured location data.

33. The computer as in Claim 32 wherein the process further
2 comprises:
using a mobile unit computer in communication with a global
4 positioning satellite receiver to capture said location data.

34. The computer as in Claim 32 wherein the process further
2 comprises:
using a mobile unit computer in communication with a sound
4 board for capturing said free speech stating verbal observations
containing voice data.

35. The computer as in Claim 32 wherein the process further
2 comprises:
constructing a predefined reference grammar for said voice
4 data to be captured;
incorporating a semantic relationship structure in said
6 predefined reference grammar; and

using said predefined reference grammar and said semantic
8 relationship structure to enable said voice data in at least two of
said raw verbal observations to be combined automatically with said
10 captured location data into a single record in a geographic
information system database.

36. The computer as in Claim 35 wherein the process further
2 comprises:

using a mobile unit computer for capturing both said location
4 data and said free speech stating verbal observations containing
voice data, and

6 transferring said captured location data and said captured
voice data from said mobile unit computer to a processing computer,
8 wherein said processing computer combines said captured voice data
and said captured location data into said single record which is
10 stored in said geographic information system database which is
connectable to said processing computer.

37. An apparatus for automatically processing and managing
2 spatial asset information, the apparatus comprising:

a processing computer for receiving a plurality of field data
4 that has been collected; and

a data repository connectable to said processing computer for
6 receiving processing results of said processing computer, wherein
said data repository further comprises,

8 a plurality of reference networks;

a geographic information system having a plurality of
10 asset layers;

a plurality of pre-defined instances of primary
12 observation types; and

a plurality of pre-defined associations between each of
14 said plurality of pre-defined instances of primary observation
types, wherein said data repository is configured based upon
16 said plurality of pre-defined instances of primary observation
types and said plurality of pre-defined associations;

18 wherein said processing computer,

converts each of said plurality of field data into
20 an appropriate one of said primary observation types;

correlates each of said converted primary
22 observation types of each of said plurality of field data
to an appropriate one of said plurality of reference
24 networks and an appropriate one of said plurality of
asset layers; and

26 updates said appropriate one of said plurality of asset
layers with each of said converted primary observation types
28 of each of said plurality of field data.

38. The apparatus defined in Claim 37 further comprising:

2 a mobile unit computer for collecting said plurality of field
data; and

4 a radio frequency transmitter connectable to said mobile unit
computer for transferring said collected field data to said
6 processing computer.

39. The apparatus defined in Claim 38 wherein said mobile
2 unit computer further comprises:

a microphone connectable to a sound board for capturing free
4 speech stating verbal observations containing voice data; and

6 a global positioning satellite receiver for capturing location
data contemporaneously with each of said verbal observations,
wherein each of said captured verbal observations and said
8 contemporaneously captured location data is time-stamped to create
a plurality of raw verbal observations.

40. The apparatus defined in Claim 39 wherein said data
2 repository further comprises:

a geographic information system database;

4 a reference grammar for interpreting captured voice data
contained in said plurality of raw verbal observations, wherein
6 said reference grammar has a semantic relationship structure for
combining said captured voice data contained in at least two of
8 said plurality of raw verbal observations; and

a data converter for using said reference grammar and said
10 semantic relationship structure to enable said captured voice data
in said at least two of said plurality of verbal observations to be
12 combined automatically with said captured location data into a
single record in said geographic information system database.

41. The apparatus defined in Claim 40 wherein said reference
2 grammar and said semantic relationship structure are configured for
a specific form for a specific application.

42. The apparatus defined in Claim 41 wherein said specific
2 application is a street maintenance application and said reference
grammar and said semantic relationship structure are configured to
4 said specific form for use in said street maintenance application.

43. The apparatus defined in Claim 40 wherein said processing
2 computer further comprises:

a processing computer clock used for time-stamping all records
4 in said geographic information system database.

44. The apparatus defined in Claim 43 wherein said mobile
2 unit computer captures a third stream of sensor data, and further
wherein said processing computer clock is used to time-stamp all
4 captured third stream of sensor data, and further wherein said data
converter automatically combines specific items of sensor data into
6 specific records having specific voice data and specific location
data by using said time-stamping as a synchronizing key.

45. The apparatus defined in Claim 37 wherein said data
2 repository further comprises:

4 a plurality of analysis tools automatically configured to
exploit data in said data repository based on said plurality of
pre-defined instances of primary observation types.